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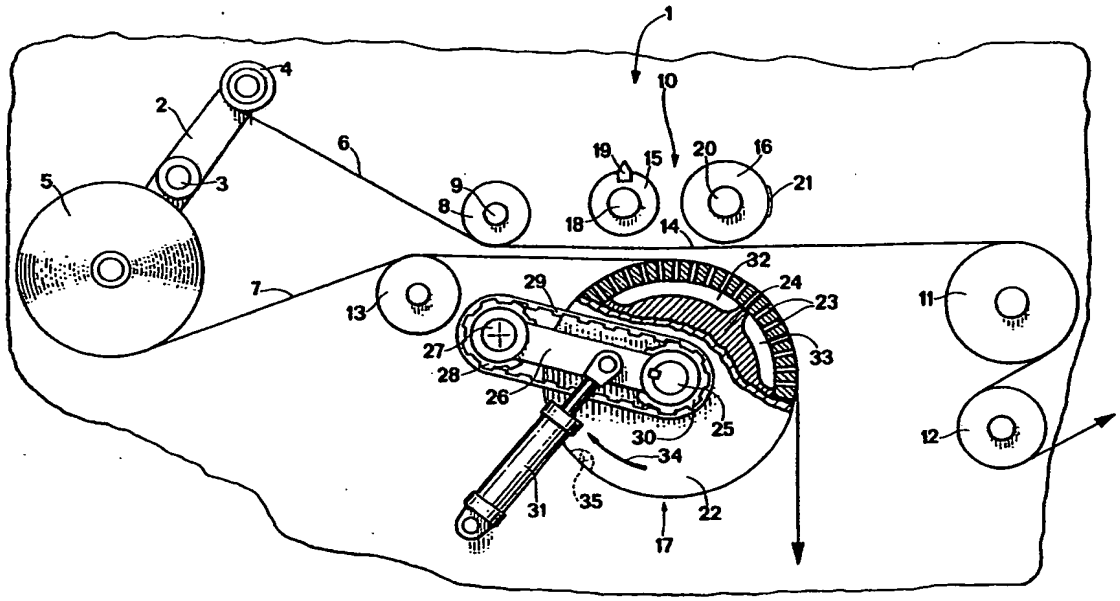
(54) Splicing webs

(57) During the splicing of webs, the replacement web (7) is accelerated up to the speed of the expiring web (6) by suction roller (22) as it travels along a path parallel to the expiring web (6). A web cutter (19) and a web joining roller (16) are positioned on the opposite side of the webs to the suction roller (22) and the cutter (19) and joining roller (16) both cooperate with the surface of the suction roller (22) as the webs are severed and spliced. As shown, the suction roller (22) is pivoted towards the cutter and joining roller to effect the splice. Alternatively, the cutter and joining roller may move towards a fixed suction roller, the cutting blade (19) may be fixed; or a cutting blade (35) is mounted in the surface of the suction roller (22).



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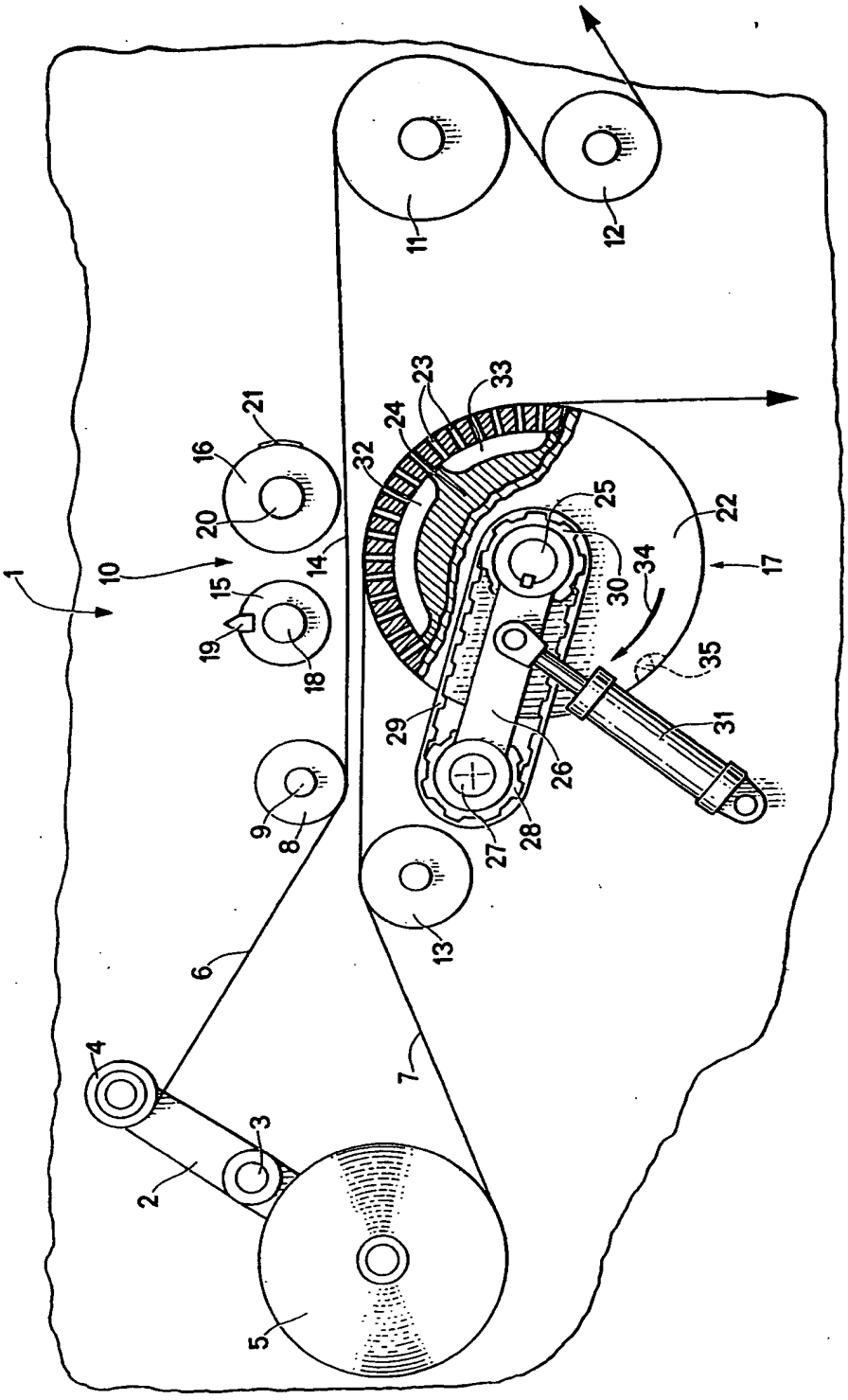
The drawing(s) originally filed was/were informal and the print here reproduced is taken from a later filed formal copy.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SPECIFICATION

Method of replacing a first running-out coil of strip material with a second new coil

The present invention relates to a method of replacing a first running-out coil of strip material with a second new coil.

On production machinery, such as cigarette manufacturing machines, on which strip material, e.g. paper, wound on a coil is used, troublefree operation of the machine depends on the extent to which the strip on the running-out coil can be joined flush to that of the new one.

To solve this problem, the known method of replacing the running-out coil works as follows. The running-out strip and a strip wound off a new coil are placed side by side, fed forward at the same speed, cut simultaneously by a cutting device and then connected together with the end of the running-out coil contacting the starting end of the new strip along the cutting line.

On known devices operating in this way, the said new strip is accelerated, to bring it up to the speed of the running-out strip, by means of an accelerating element usually consisting of a roller which, in the strip feed direction, is located downstream in relation to both the said cutting device and a sticking device for joining the ends of the two strips together. In short, therefore, known devices of the above type comprise an accelerating element, a cutting device and a sticking device which, being totally separate from the structural point of view, are extremely complex and relatively cumbersome.

The aim of the present invention is to provide a method of replacing running-out coils with new ones using relatively simple, compact devices.

With the aims in view, the present invention relates to a method of replacing a first running-out coil of strip material with a second new coil on a machine, characterised by the fact that it comprises stages in which:

—the new strip on the said second coil is fed, by means of an accelerating element, along a route essentially parallel to a section of the running-out strip on the said first coil, the said route extending between the said accelerating element, on one side, and a cutting and sticking element, on the other, the latter elements being arranged adjacent to each other, the first upstream from the second in the feed direction of the said strips;

—the said accelerator element is activated so as to bring the said two strips up to essentially the same speed;

—the said elements are put through a first movement so as to provide for an operating position in which the said accelerator element can operate in conjunction with both the said cutting and sticking elements;

—the said cutting element is activated so as to operate in conjunction with the said accelerator element and so cut both strips simultaneously;

—the said sticking element is activated so as to operate in conjunction with the said accelerator element and so connect one end of the said running-out strip, downstream from the said cut, to one end of the said new strip, upstream from the said cut;

—the said elements are put through a second movement opposite to the said first movement.

The invention will now be described by way of a non-limiting example with reference to the attached drawing showing a coil-changing device designed to operate according to the method described above.

Number 1 on the attached drawing indicates a coil-changing device comprising an arm (2) assembled so as to turn round a centre pin (3) and supporting, at each end, two rotary coils (4, 5) the rotation axes of which are parallel to pin 3.

Coil 4 at the top is the one that is actually used, whereas coil 4 is kept as a stand-by on the supporting pin. Coils 4 and 5 consist of strips 6 and 7 respectively, the first extending over and contacting idle roller 8 on shaft 9 for detouring strip 6 inside an area defining a cutting and sticking station and indicated, as a whole, by number 10. Once past station 10, strip 6 winds round two detour rollers (11, 12) before being fed to a utilizing device (not shown) which imparts a given unwinding tension. As already stated, strip 7 on coil 5 is usually kept on stand-by under strip 6 and is detoured by roller 13 inside station 10 where strip 7 is usually arranged loosely along a stand-by route essentially parallel to section 14 of strip 6 extending through station 10. Station 10 comprises a cutting roller or element (15) and a sticking roller or element (16), arranged side by side on the same side of section 14 of strip 6, as well as an accelerating unit (17) arranged on the opposite side of section 14 to rollers 15 and 16. Roller 15 is fitted on to a drive shaft (18) and provided with an essentially radial circumferential blade (19) driven by shaft 18 from the idle position shown on the drawing into a work position facing section 14. Sticking roller 16 is fitted on to drive shaft 20 which is connected at an angle to shaft 18 and designed, using known means not shown on the drawing, to retain a gummed strip (21) on its circumference. Accelerator unit 17 comprises a hollow roller (22), also referred to as an accelerator element, with evenly-spaced radial holes (23) round its circumference and assembled so as to turn round a drum (24) supported on a shaft (25) connected to roller 22 by a spider structure not shown on the drawing. Shaft 25 is supported on one end of arm 26, the other end of which is connected so as to turn round

drive shaft 27 which is parallel to shaft 25 and fitted with pulley 28. The latter is connected by belt 29 to idle pulley 30 on shaft 25, the said pulley being connected to the said spider structure not shown on the drawing. At one point on arm 26, an actuating device (31) is connected for moving arm 26 round the axis of shaft 27 so as to shift roller 22 from the idle down position shown on the drawing to a raised working position in which the outer circumference of roller 22 is set essentially tangent to the outer circumference of both rollers 15 and 16.

The circumference of drum 24 has two circumferential slots (32, 33) the first of which is located upstream from the second, in relation to the direction of rotation of roller 22 indicated by arrow 34, and extends along an arc of a circle more or less facing rollers 15 and 16. Slot 32 is connected to a suction device and slot 33 to a source of fluid under pressure, neither of which are shown on the drawing.

Operation is as follows. Before coil 4 runs out, the operator unwinds the end of strip 7 off coil 5 and winds it round detour roller 13 and accelerator roller 22 which, by means of suction, holds strip 7 on its outer circumference facing rollers 15 and 16; When coil 4 is about to run out, an end-of-coil sensor (not shown), designed to operate in conjunction with coil 4, supplies a signal for activating shaft 27. Via belt 29, shaft 27 turns roller 22 at gradually increasing surface speed until it more or less equals the supply speed of strip 6. As roller 22 turns, the suction through holes 23, communicating at all times with slot 32, causes strip 7 to move forward until its speed equals that of strip 6. At this point, a sensor (not shown) for detecting the speed of roller 22 activates actuator 31 which causes roller 22 to shift to the said operating position more or less contacting the circumference of rollers 15 and 16. At the same time, rollers 15 and 16 are rotated, the former from the idle position shown on the drawing to an operating position in which its blade (19) operaes in conjunction with the circumference of roller 22, also in its operating position, so as to cut strips 6 and 7 simultaneously.

Afte the strips have been cut, the portion of strip 6 downstream from the cut keeps moving at the same speed on account of it being pulled by the utilizing device (not shown) downstream from roller 12, whereas the portion of strip 6 upstream from the cut stops. At the same time, the portion of strip 7 downstream from the cut is blown out by the jet from holes 23 communicating with slot 33, whereas the portion of strip 7 upstream from the cut continues moving on roller 22 to which it is held by suction through holes 33 communicating with slot 32. Consequently, the rear end of cut strip 6 and the front end of cut strip 7 contact each other on the circumference of roller 22, at which point, roller 16 is turned to bring its gummed strip (21) into the area of tangency between itself and roller 22 as the said two ends move through and so join strips 6 and 7 together.

To prevent blade 19 from cutting strip 7 again the next time it moves through the operating position, as soon as strips 6 and 7 have been joined, actuator 31 is operated so as to bring roller 22 back to the idle position and rollers 15 and 16 stopped so as to enable coil 4 to be changed, arm 2 to be turned round pin 3 and the new strip to be wound round rollers 13 and 22.

As clearly shown in the above description, besides acting as an accelerator roller for strip 7, roller 22 also acts as a base for both blade 19, during cutting, and roller 16 during application of gummed strip 21.

To those killed in the art it will be clear that changes can be made to device 1 described by way of a non-limiting example without however departing from the scope of the present invention.

In particular, roller 22 could be moved into the said operating position by shifting rollers 15 and 16 instead of roller 22 itself. Also, rollers 15 and 16 could be replaced by elements designed to move towards section 14 of strip 6 and operate in conjunction with the outer surface of roller 22.

According to an alternative arrangement of the device the main elements of which are represented by a dotted line on the drawing, roller 22 is fitted with a circumferential blade (35) designed to operate in conjunction with blade 19 on roller 15. The tip speed of the cutting edge on blade 35 differs from that of the cutting edge on blade 19 (preferably slower) and roller 22 may be powered and timed in relation to roller 15 so as to enable, when the said operating position is reached, a cleaner cut of strips 6 and 7 than that obtainable by shearing. According to a further variation of the device not shown on the drawing, blade 19 may be fixed with its cutting edge essentially tangent in relation to strip 6. In this case, when roller 22 moves into the said operating position, strips 6 and 7 are cut the instant the cutting edge of blade 35 encounters that of blade 19.

CLAIMS

1. Method of replacing a first running-out coil of strip material with a second new coil on a machine, characterised by the fact that it comprises stages in which:

—the new strip on the said second coil is fed, by means of an accelerating element, along a route essentially parallel to a section of the running-out strip on the said first coil, the said route extending between the said accelerating element, on one side, and a cutting and sticking element, on the other, the latter elements being arranged adjacent to

each other, the first upstream from the second in the feed direction of the said strips;

—the said acceleraor element is activated so as to bring the said two strips up to essentially the same speed;

—the said elements are put through a first movement so as to provide for an operating position in which the said accelerator element can operate in conjunction with both the said cutting and sticking elements;

—the said cutting element is activated so as to operate in conjunction with the said accelerator element and so cut both strips simultaneously;

—the said sticking element is activated so as to operate in conjunction with the said accelerator element and so connect one end of the said running-out strip, downstream from the said cut, to one end of the said new strip, upstream from the said cut;

—the said elements are put through a second movement opposite to the said first movement.

2. Method according to Claim 1, characterised by the fact that the said accelerator, cutting and sticking elements consist of rollers

3. Method according to Claim 1, characterised by the fact that the said cutting element consists of a fixed blade.

4. Method according to Claim 2, characterised by the fact that, in the said operating position, the said accelerator roller is arranged essentially tangent to both the said cutting roller and the said sticking roller.

5. Method according to any of the foregoing Claims, characteristed by the fact that the said second shift is made before the said cutting element can make another cut.

6. Method according to any of the foregoing Claims, characterised by the fact that the said cutting and sticking elements are mounted in a fixed position, the said shifts being made by moving the said accelerator element.

7. Method according to any of the foregoing Claims, characterised by the fact that the said accelerator element is fitted with a blade which operates in conjunction with the said cutting element.

8. Method of replacing a first running-out coil of strip material with a second new coil on a machine, as described in the foregoing Claims, for the purposes already mentioned and essentially as described and illustrated on the attached drawing.

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